Soil-Borne Pathogens Associated to New Crops of Cherry Tomato in the Province of Granada (Spain)

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Keywords: *Phytophthora parasitica, Verticillium dahliae, Meloidogyne*, root rot, root-knot, wilt

Abstract

Cherry tomato has become a major crop for the continental areas of south-eastern Spain in the last ten years, reaching more than 170 ha and increasing. These crops are conducted under net greenhouses on dry soils that previously had been cultivated for years with typical dry Mediterranean crops (grapevine, olive, cereal). After the second year of cultivation, first phytosanitary problems appeared. Symptoms observed in affected tomato plants reminded soil-borne causes. Plants showed general wilt and chlorosis all along the crop cycle and particularly during the harvest period. Losses even reached 100% dead plants in several fields. A continuous survey was conducted from 2003 to 2008, in 4 different production areas, two in the "new" continental area (Los Bermejales and El Negartín) and two in the "traditional" coastal area (Motril and Albuñol). A total of 56 fields were surveyed and three soil-borne pathogens have been detected and isolated. *Phytophthora parasitica* was present in 65% of continental fields and 10% of coastal fields. *Verticillium dahliae* was only found in the continental fields, ranging from 29% in 2004 to 90.74% of surveyed fields in 2008 in El Negratín area. The nematode *Meloidogyne incognita* was only detected in Los Bermejales area, reaching 45% of surveyed fields. The rapid spread of these pathogens and the absence of symptoms on the previous crops (grapevine, olive and cereals) are discussed.

INTRODUCTION

Cherry tomato is a greenhouse profitable crop in the south-eastern area of Spain. This crop has been developed in the area from the 1980s and currently represents the main income for more than 500 growers in the province of Granada, where is the highest surface devoted to this crop in Spain, exceeding production of 40,000 t per year. The production area has been concentrated in the coastal areas of the province until the late 1990s, when new fields in the continental areas of the province where started to be cultivated with cherry tomato. The reason for this new situation is the fact that the coastal fields were not able to produce profitability in summer because of the high temperature in the greenhouses and the high pest presion around the crops. So the solution to cover the whole year market with Granada's production was the introduction of the crop in new areas with lower temperatures and free of intensive crops. Currently these areas cover more than 170 ha and the surface is increasing. These crops are conducted under net greenhouses on dry soils that previously had been cultivated for years with typical dry Mediterranean crops (grapevine, olive, cereal). After the second year of cultivation, first phytosanitary problems appeared. Symptoms observed in affected tomato plants reminded soil-borne causes (Figs. 1 and 2). Plants showed general wilt and chlorosis all along the crop cycle and particularly during the harvest period. Losses even reached 100% dead plants in several fields.

Proc. III[rd] IS on Tomato Diseases
Eds.: A. Crescenzi and [redacted]anigliulo
Acta Hort. 914, ISHS 2[redacted]

MATERIALS AND METHODS

Survey

A continuous survey was conducted from 2003 to 2008, in 4 different production areas, two in the "new" continental area (Los Bermejales and El Negratín) and two in the "traditional" coastal area (Motril and Albuñol) (Table 1). A total of 56 fields were surveyed and three soil-borne pathogens have been detected and isolated. Surveying consisted on sampling diseased plants from fields with a disease incidence affecting more than 10% of total plants per farm. A minimum of 5 plants per field were sampled and analysed in the laboratory. All roots plants were observed under microscope searching for knot-nematodes and fungi.

Analytical Methods

For each plant, three root pieces were plated on petri dishes containing malt-extract agar (MEA). Also, disinfested stem pieces were taken from one-meter up from the crown of the plant, cut to 1-cm high discs and plated on MEA (Tello et al., 1991). The incubation period for fungi depended on the fungi and the temperature in the laboratory. The earliest on being isolated was *Phytophthora parasitica* (<48 h) and the latest *Verticillium dahliae* (>5 days). Identification of fungi was achieved by using different keys (Bartnett and Hunter, 1992; Nelson et al., 1983; Erwin and Ribeiro, 1996).

RESULTS AND DISCUSSION

Phytophthora parasitica was present in 65% of continental fields and 10% of coastal fields. *Verticillium dahliae* was only found in the continental fields, ranging from 29% in 2004 to 90.74% of surveyed fields in 2008 in El Negratín area. The nematode *Meloidogyne incognita* was only detected in Los Bermejales area, reaching 45% of surveyed fields (Fig. 3). Some of these pathogens have a wide spectrum of hosts (*Meloidogyne* spp., *Verticillium dahliae*) and their existence in the soils can be explained by the previous presence of other crops as olive, cereals, almond or grapevine. The quick spread of the diseases can be figured out by the use of tilling machinery in the tomato soils and in familiar orchards where vegetables have been commonly cropped. On the other hand, bad crop techniques are usual for these new intensive growers: as examples, excessive irrigation is normal and tillage is usual (this moves pathogens to pathogen-free areas of the farm). Soil disinfection with chemicals such as dichloropropene plus chloropicrin, is not effective because of the lack of a right application (mostly a good soil moisture previous to the treatment). Another factor that enhances the spread of some pathogens is the absence of a plastic cover over the soil (which is a difference to traditional Spanish greenhouses), which increases the soil humidity after rain periods, and this can distribute the fungi and the nematodes easier. In general, we can observe how an incorrect crop and soil managing can develop in a fast spread of these soil-borne pathogens.

Literature Cited

Barnett, H.L. and Hunter, B.B. 1972. Illustrated Genera of Imperfect Fungi, 4th ed. Macmillan Publishing Company, New York.

Erwin, D.C. and Ribeiro, O.K. 1996. *Phytophthora* Diseases Worlwide. APS Press. St. Paul, Minnesota.

Nelson, E., Toussoun, T.A. and Marasas, W.F.O. 1983. *Fusarium* Species. An Illustrated Manual for Identification. The Pennsylvania State University Press.

Tello, J.C., Varés, F. and Lacasa, A. 1991. Análisis de muestras. p.39-72. In: VV. AA. Manual de Laboratorio. Diagnóstico de Hongos, Bacterias y Nematodos Fitopatógenos. Ministerio de Agricultura, Pesca y Alimentación, Madrid.

Tables

Table 1. Description of the areas surveyed.

Area code	1 (Continental)	2 (Continental)	3 (Coastal)	4 (Coastal)
Area name	El Negratín	Los Bermejales	Motril	Albuñol
Number of fields surveyed	21	20	10	5

Figures

Fig. 1. Cherry tomato plant showing wilt symptoms.

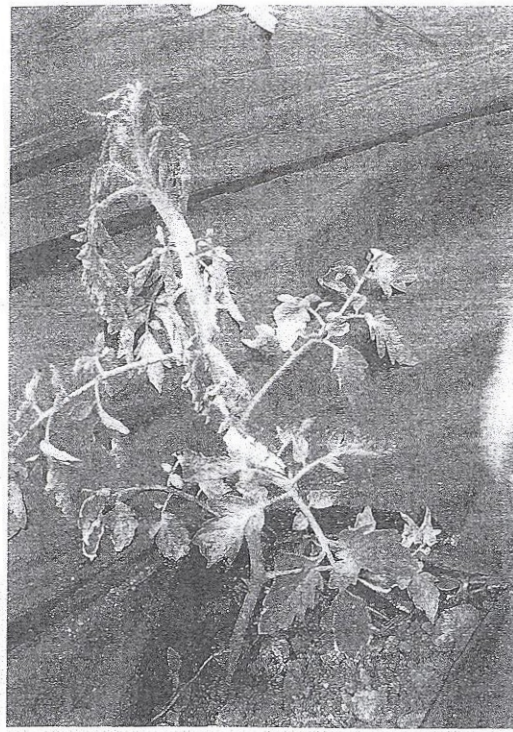

Fig. 2. Cherry tomato plantlet showing wilt symptoms.

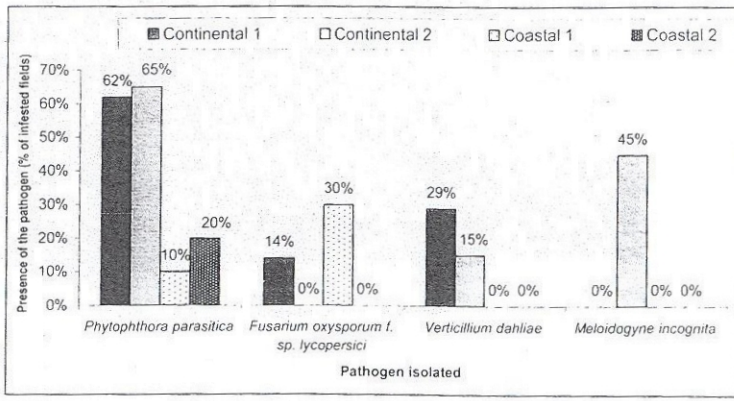

Fig. 3. Frequency of isolation of different pathogens from the surveyed fields.